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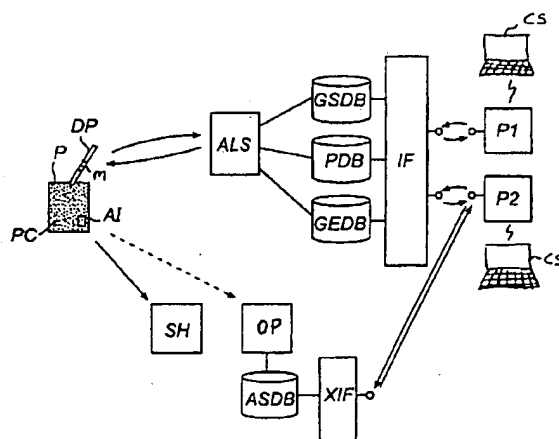
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(54) Title: INFRASTRUCTURE FOR MANAGEMENT AND COMMUNICATION OF INFORMATION



(57) Abstract: An information management system comprises a plurality of products (P) provided with a position code (PC), a plurality of digital pens (DP) capable of reading the position code, and a server means communicating with the digital pens (DP) in at least one communication network. The server means includes a position database (GSDB) which associates positions coded by the position code (PC) with rules for information management. The digital pens (DP) are arranged to communicate to the server means, on a first communication path, information registered on the products (P) in the form of at least one position which is coded by said position code. The server means further includes an interface unit (IF) by means of which actors in the system, on a second communication path, are allowed to enter data into and retrieve data from one or more databases of the system. Such actors include pen manufacturers, paper/product manufacturers, pattern administrators, service handlers, network operators, and pen owners. A host unit, which provides a site on a public network and is arranged for connection to the interface unit (IF), is also disclosed, as well as methods of coordinating actors, handling service licenses, and producing, registering and administering digital pens-

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INFRASTRUCTURE FOR MANAGEMENT AND COMMUNICATION OF  
INFORMATION

5    Field of the invention

        The present invention generally relates to the field of digital communication, and more specifically to an infrastructure for management and communication of information which is registered with a digital pen.

10   Background of the invention

        Traditionally, information is written and distributed by means of pen and paper. However, such paper-based information is difficult to manage and communicate in an efficient way.

15       Computers are to an ever-increasing extent used for management and communication of information. The information is typically input by means of a keyboard and stored in the computer memory, for example on a hard disk. However, it is a slow process to input information with a  
20   keyboard, and there is a significant risk of errors occurring in the process. Graphic information, such as drawings and images, is normally fed to the computer through a separate device, such as a scanner or the like. The process of feeding such information to the computer  
25   is time-consuming, lengthy, and often yields unsatisfactory results. When the information eventually is located in the computer, it can easily be communicated to other, for example as an e-mail or SMS via an Internet connection, or as a fax via a fax modem.

30       The present Applicant has proposed a remedy to this problem in the international application WO 01/16691, which is incorporated herein by this reference and in which the Applicant envisages the use of a product having a writing surface which is provided with a position code.  
35   The position code, which codes a plurality of positions on the surface, enables electronic recording of information that is being written on the writing surface, by

means of a digital pen which detects the position code. The product also has one or more activation icons which, when detected by the digital pen, cause the pen to initiate a respective predetermined operation which utilizes  
5 the information recorded by the pen.

More specifically, the position-coded product has a built-in functionality, in that different positions on the product, such as positions within the activation icon and positions within the writing surface, are dedicated  
10 for different functions. Furthermore, the position code is capable of coding coordinates of a large number of positions, much larger than the number of necessary positions on the product. Thus, the position code can be seen as forming a virtual space which is defined by all  
15 positions that the position code is capable of coding, different positions in the virtual space being dedicated for different functions and/or actors.

The above-concept can be used for a number of different purposes. The combination of pen and position-coded  
20 product can be used as an input device to a computer, a PDA, a mobile phone or the like. For example, text and sketches written on a position-coded notepad can be transferred via the pen to a computer. Additionally, the combination of pen and position-coded product allows for  
25 global communication, directly from the product via the pen, by the position code on the product being dedicated for such communication. For example, the information registered by the pen can be transformed to a fax message, an e-mail or an SMS, and then be sent from the pen to a  
30 recipient. Further, the combination of pen and position-coded product can be used in e-commerce. For example, the digital pen can be used to order an item from a position-coded advertisement in a magazine, by the position code in the advertisement being dedicated for such a service.

35 The above concept has been implemented in a system or infrastructure, which is shown in Fig. 1 and which is further disclosed in Applicant's international patent

applications PCT/SE00/02640, PCT/SE00/02641, and PCT/SE00/02659 which are incorporated herein by this reference. The system of Fig. 1 comprises a plurality of digital pens DP, a plurality of products P with a position code PC, a look-up unit ALS, and a plurality of service handler units SH. The look-up unit ALS comprises one or more computer servers that communicate with a database containing the virtual space and information related thereto. For example, the database could associate one or more positions in the virtual space with a network address to a particular service handler unit SH. The service handler unit SH is a server unit effecting a service, such as storing or relaying digital information, or initiating transmission of information or items to a recipient.

When the digital pen DP is operated to mark an activation icon AI on the position-coded product P, the pen DP initiates an operation to forward a message to the look-up unit (step 1), for example via short-range radio transmission to a mobile phone MP acting as a modem for connection to the look-up unit ALS. The message contains a unique pen identifier and at least one position from the digital information that has been recorded electronically on the writing surface of the product P. Based on the position content of the message, the look-up unit ALS instructs the digital pen DP to contact a specific service handler unit SH at the above-mentioned network address (step 2). The pen DP then sends the message to the service handler unit SH (step 3), which instructs the pen DP on what data to send, and how to format and tag that data (step 4). After having received the requested data from the pen DP (step 5), the service handler unit SH returns a verification thereof to the pen DP (step 6).

The information management system of Fig. 1 involves many inter-reliant actors: companies manufacturing the digital pens ("pen manufacturers"), companies manufacturing the position-coded products ("paper manufacturers"),

companies providing different services by means of the service handler units ("service handlers"), a company administrating the position-code based on the virtual space database ("pattern administrator"), operators providing the communication link between the digital pens and the different units ("network operators"), and a multitude of users of digital pens ("pen owners").

One major problem that remains to be solved is how to coordinate the different actors in the system in a simple and efficient way.

#### Summary of the invention

It is an object of the present invention to provide a solution to, or at least mitigate, the above-mentioned problem.

This object is achieved according to the invention by an information management system according to claim 1, a host unit according to claim 17, and methods according to claims 21, 37, 40, 42, 44 and 46. Preferred embodiments are defined by the dependent claims.

#### Brief description of the drawings

Preferred embodiments of the invention will be described in more detail below with reference to the accompanying drawings.

Fig. 1 shows a prior-art system for management and communication of information.

Fig. 2 shows an embodiment of a system for management and communication of information including an interface unit according to the present invention.

Fig. 3 illustrates how the present invention allows different actors to enter data into and retrieve data from the system of Fig. 2.

Fig. 4 shows an overview of the portal platform in the system of Fig. 2.

Figs 5 and 6 show the structure of the interface unit in greater detail.

Fig. 7 shows two examples of communication links between the portal and the interface unit.

Figs 8-11 illustrate the flows of data within the system for different user scenarios.

Description of preferred embodiments

In the following, the inventive system will be  
5 described with reference to the embodiment shown in  
Figs 2-3. After this general presentation of the system  
structure and the flow of data therein, the structure  
of the interface to the databases of the system will  
be further described with reference to Figs 4-7. Then,  
10 examples of how different actors can access the system  
will be illustrated with reference to Figs 8-11.

The system of Fig. 2 includes a multitude of digital  
pens DP and position-coded products P (only one of each  
shown in Fig. 2), a look-up unit ALS, and a plurality of  
15 service handler units SH (only one shown in Fig. 2). The  
configuration and interrelation of the different parts of  
the system, as well as the communication of information  
between these parts, have already been described above  
and will therefore not be repeated here.

20 It should be noted, however, that the information  
can be transmitted in any suitable way from the digital  
pen DP to the look-up unit ALS and the service handler  
units SH. In one embodiment, wireless transmission of  
information is effected from the digital pen DP to a  
25 network connection unit, which in turn transmits the  
information to the look-up unit ALS and service handler  
units SH, respectively. The network connection unit can  
be the mobile phone MP shown in Fig. 1, or a PDA, a com-  
puter or any other suitable unit with an interface to a  
30 computer network such as the Internet or a LAN. Alterna-  
tively, the network connection unit can be an integral  
part of the digital pen DP.

The look-up unit ALS is connected to a virtual space  
database GSDB which includes data on the actor associated  
35 with each position which is coded, directly or indirect-  
ly, by the position code PC. Direct coding implies that  
the actual positions coded by the position code PC are

communicated to the units in the system. Indirect coding implies that the actual positions coded by the position code PC are transformed before being communicated from the digital pen DP to the units of the system. For  
5 example, only a subset of the data representing each actual position may be communicated. In one such embodiment, the actual positions are grouped in the database GSDB into regions of standard size, so that each actual position can be transformed into a region identifier,  
10 which identifies the associated region, and a local position within this region. The region could be a digital page that corresponds to the position-coded product P. Thus, the amount of data transmitted from the digital pens DP is reduced, since the region identifier only  
15 needs to be transmitted occasionally, typically when the actual positions change from one region to another, and since the local positions can be represented in a more compact form than the actual positions. A more detailed example is found in the above-mentioned PCT/SE00/02640.

20 The virtual space database GSDB may also store data on the functionality of the positions coded by the position code PC, although such data might instead, or in addition, be stored in the respective service handler units SH.

25 The look-up unit ALS is also connected to a pen database PDB, which includes data on all digital pens in the system, such as a unique pen identifier of each pen and all settings or properties that are associated with each pen. The pen database PDB also includes data on the  
30 manufacturer of each pen. In addition thereto, the look-up unit ALS is connected to an event database GEDB, which includes data on the transactions taking place in the look-up unit ALS, i.e. the address requests made by the pens in the system and the address responses returned to  
35 the pens, as well as any errors occurring in the process.

As an alternative to individual databases as shown in Fig. 2, the look-up unit ALS could instead be connect-

ed to one all-embracing database, or each individual database could be distributed over more than one physical unit.

The system also includes one or more networks in which network operators handle the communication between the digital pens DP and the look-up unit ALS, and between the digital pens DP and the service handler units SH. To this end, the owner of a pen has opened a subscription at one of the network operators. This network operator could also act as a service handler in the system, for example by means of a server unit OP providing communication services that allows the pen owner to send electronic messages, for example e-mail, SMS or fax, based on information written on the position-coded products P by means of the digital pen DP. The server unit OP of the network operator could also provide for network storage of information generated in the system, for example entries in an position-coded calendar or notebook. When acting as a service handler, the network operator maintains an application database ASDB which contains data on user-specific settings for different applications, for example a signature or electronic business card to be attached to e-mail messages, where and how to store sent messages, etc.

The actors in the system disclosed in Fig. 2 include pen owners, pen manufacturers, paper manufacturers, service handlers, network operators, and a pattern administrator.

In the embodiment of Fig 2, the system includes two Internet portals P1, P2 hosted by one or more web servers which are interfaced to the databases of the system. One portal P1 is a so-called Partner Portal, i.e. a portal which allows pen manufacturers, paper manufacturers, pattern administrators, service handlers and network operators to access selected portions of the databases of the system. The other portal P2 is a so-called Pen Owner Portal, i.e. a portal which allows the pen owners to access selected portions of the databases in the system.



In an alternative embodiment, the functionality of the two portals is merged into one general portal.

Figs 2-3 show that an interface unit IF connects the portals P1, P2 to the databases of the look-up unit ALS.  
5 The interface unit IF, which is described in more detail below, handles the low-level accesses to the databases GSDB, GEDB, PDB in the system. The portal P2 could be connected to external databases, such as the application database ASDB of the network operator, by means of an  
10 external interface unit XIF of similar design.

The above Internet portals P1, P2 are implemented on one or more Internet-connected servers providing a graphical user interface (GUI) to the actors via the Internet. It should be noted, however, that Internet is  
15 representative of a preferred use of the present invention, but should not be considered limiting, as the invention could apply in other networks and combinations of networks.

As indicated in Fig. 2, the actors in the system can  
20 access the portals P1, P2 by means of a web browser on any suitable client station CS, such as a personal computer, a PDA, a mobile phone etc.

From Fig. 3, which illustrates the interaction of the actors with the system, it is clear that the Internet  
25 portals P1, P2, by means of the interface unit IF, act a hub in the inventive system. Thus, the interface unit IF provides an auxiliary communication path to the databases GSDB, PDB, GEDB, ASDB of the system, beside the communication path that is set up between each digital pen and  
30 the look-up unit and its databases GSDB, PDB, GEDB.

By means of the interface unit IF, via the portal P1, pen manufacturers are able to retrieve lists of unique pen identifiers to be entered into the hardware or software of the digital pens as they are manufactured.  
35 As already mentioned, such pen identifiers are stored in the pen database PDB. As an additional advantage, the interface unit IF allows for the use of public key

encryption in the system, in that the pen manufacturers easily can transfer a public encryption key for each digital pen DP to the pen database PDB, and retrieve a public encryption key for the look-up unit ALS for storage in the digital pens. Further security data, such as a pen-specific PIN code, could be transferred to the pen database PDB together with the public encryption key.

Further, paper and product manufacturers are able to retrieve portions of the virtual space to be put on the product. For example, a notebook manufacturer can license a section of the virtual space, retrieve the corresponding position-code, or an algorithm for calculating the same, split the licensed section into the desired number of page-sized position code areas, and print the position code areas on the physical pages of a notebook. Further, paper and product manufacturers are able to enter or change properties in the virtual space database GSDB, such as the network address of the service handler unit SH to which the look-up unit ALS should direct the pen, an expiry date of this address, encryption settings, etc. Alternatively, the pattern administrator can access the virtual space database on behalf of the paper and product manufacturers.

Like the paper and product manufacturers, service handlers such as companies promoting and/or selling a service or an item via a position-coded product, could retrieve a position-code through the Internet portal, for use on an advertisement, an order form, or the like. Service handlers may also be able to enter or change settings in the virtual space database GSDB.

By means of the interface unit IF, via the portal P1, network operators are, for example, able to register a new subscription in the pen database PDB, and to lock a specific digital pen in the pen database PDB to block the pen from the look-up unit ALS in the system. The network operators could also be allowed to search the event database GEDB for trouble shooting purposes.

By means of the interface unit IF, via the portal P2, pen owners are able to view, change and/or add settings related to their digital pen. These settings are stored in the pen database PDB and/or in the application database ASDB. The settings in the pen database PDB can include personal data such as name, postal address, delivery address, e-mail address, home phone number, mobile phone number, home fax number, business fax number, business phone number, credit card number etc.

The settings in the pen database PDB can also relate to feedback, for example to what extent the pen user should be prompted for confirmation before anything is sent from the pen. It is also conceivable to let the pen owner set up a filter that specifies the personal data that can be requested by different service handler units SH. Further, the user-controllable settings in the pen database PDB can relate to the operation of the pen, for example the degree of data compression in the pen, the maximum residence time in the pen for registered information, any pen-specific PIN code used in authentication of the pen etc. The data in the application database ASDB can for example relate to a personal signature or an electronic business card to be attached to e-mail messages, a customized layout of fax messages, where and how to store sent messages, a default cc address for e-mail messages, etc. In case the pen owner has more than one pen, he is able to use an import/export function to copy settings between his different pen entries in the pen database.

By means of the interface unit IF, via the portal P2, pen owners are also able to lock their digital pens in the pen database PDB to block the pen from the look-up unit ALS in the system, for example when the digital pen is lost or stolen.

By means of the interface unit IF, via the portal P2, pen owners are also allowed to view events stored in the event database GEDB.

Further, by means of the external interface unit XIF, via the portal P2, pen owners can access other databases (not shown) of the network operator OP to view billing data, to view sent messages, to access a personal electronic calendar or notebook etc.

It should be noted that the portals P1, P2 can be hosted by any party, since any authorized server hosting a site on a public network, such as the Internet, is allowed to remotely connect to the interface unit IF.

One such party is the pattern administrator who has the ultimate control over the look-up unit ALS and the databases GSDB, GEDB, PDB and who could provide the interface unit IF. Another such party could be one or more network operators, who could host a portal giving users access to operator databases as well as system databases.

It should also be realized that the portals P1, P2 can be designed based on knowledge common to the person skilled in the art, albeit with a customized GUI. The portals could also contain a database for web content management, as well as a membership database. The latter could include user account information, and store attributes for personalization of the web site, as well as data for accessing the interface unit.

One advantageous aspect of the system shown in Figs 2-3 is that the pen owner is able to store, add and change personal data in the system. Instead of requiring the pen owner to enter personal data each time he uses the combination of pen and a position-coded product, for example to write personal data in dedicated OCR fields on the product or to provide personal data in interaction with the network connection unit (MP in Fig. 1), personal data can be supplied within the system to the service handler unit SH, either automatically or on demand.

This allows for an intuitive and streamlined use of the digital pen, in that the digital pen can be used like a regular pen, with the functionality being embedded in the position-coded product surface. Further, the risk of

typing/recognition errors is minimized by the use of predetermined settings in the system.

In one embodiment, at least part of the settings in the pen database PDB are also stored in an internal memory M (Fig. 2) of the digital pen. One advantage of this approach is that these settings can be directly used in interaction with the pen owner, for example in a process of requesting confirmation, typically via a display on the network connection unit (MP in Fig. 1). Such interaction can be essentially instant, since the pen does not need to retrieve the settings from the distant pen database PDB. Further, storing pen settings in the pen itself will reduce both the load on the look-up unit ALS and the amount of data that is transferred in the system network, since the settings can be directly transferred from the pen DP to a service handler unit SH whenever necessary.

The provision of an interface unit IF allows a pen owner to access the pen database PDB via a public web site, such as the Internet portal discussed above. For example, by integrating a browser (WAP, i-mode etc) in the mobile phone, PDA or personal computer that connects the pen to the network, the pen owner is given the possibility to change his pen settings at any time.

Preferably, the system is arranged to sense any changes in the pen database PDB, and to send any updated or new settings to the pen the next time it connects to the look-up unit ALS. Since the pen settings are updated through the interface unit IF, synchronization conflicts are avoided.

In the following, an overview of a portal platform is presented with reference to Fig. 4, with a brief description of the included elements. Then, in conjunction to Figs 5 and 6, the structure and function of the included elements are described in some more detail.

Fig. 4 illustrates the logical composition of the portal platform, the elements of which are arranged in three major layers.

The outermost layer is a portal layer, which provides a GUI and includes elements that interact with the actors in the system. This layer includes the Pen Owner Portal and the Partner Portal. The Partner Portal is used both by persons that administer internal functions like managing the system databases, and partners that administer functions related to their business, wherein the different roles in the authentication (to be described below) determine which functions are available. The Pen Owner Portal is used by the pen owners to manage their pen settings.

The intermediate layer is an interface layer, which forms the interface unit and provides interfaces to the internal system databases GSDB, PDB, GEDB. The interfaces are exposed under access control, so only the needed interfaces are available for a calling application. There are two elements in the interface layer, namely a Pen Services element and a Pattern Services element.

The inner layer is a database layer which encapsulates the data sources of the look-up unit ALS, which in this case includes the virtual space database GSDB, the pen database PDB, the event database GEDB and a user database UDB. The user database UDB contains data on accounts (login/password) and connected roles and privileges. The user database UDB is accessed in the handling of authentication and access rights to the data structures in the databases.

Outside these layers, the platform further includes one package (DevCore) that contains common functions that are used by all interface layer elements, and another package (PatternCore) that encapsulates logic for position code generation and management.

The Pen Services element is designed to allow for management of user settings for a pen, management of

system settings for a pen, and registration of pens.  
The Pattern Services element is designed to allow for  
registration of paper application services, and for  
management of paper application service properties, such  
5 as where to route data, expiry date, encryption, etc.

The interface layer elements are accessed using a  
standard http(s) protocol, and each request to the inter-  
face elements returns a http(s) response including an XML  
document.

10 The responsibility of each interface layer element  
is to validate a received request (types, ranges), to  
determine access rights of the requesting user/system,  
to locate a proper database, to retrieve data therefrom,  
to transform the retrieved data into an XML document as  
15 defined by an interface specification of the interface  
layer element, and to return the XML document to the  
requesting user/system. The databases are reached from  
the interface layer with the use of IIOP and Corba.

Fig. 5 illustrates the architecture of the inter-  
20 face layer elements. The architecture defines a number  
of packages: RequestControllers (Servlets) which handle  
incoming http requests and validate interface access  
rights; ResponseControllers (JSPs) which produce the  
response content; AccessControllers (Java classes) which  
25 encapsulate internal program logic and flow, map database  
resources, and apply access rights; UtilityServices  
(Java classes) which are responsible for helper utility  
classes, object abstractions of data entities, parsers;  
PersistenceServices which wrap Corba accesses and locate  
30 database instances; and AuthenticationServices which  
manage fine-grained access rights to resources. Examples  
of the above-mentioned UtilityServices are the Pattern-  
Core and Corba Helper classes.

The AuthenticationServices package encapsulates the  
35 authentication needed by the interface layer elements.  
The responsibility of the package is to represent all  
access rights (roles and privileges) that an authenti-

cated user or system has been granted. All information needed for access restrictions is supplied from this package. The other packages can use that information to filter out correct data before passing it along.

5       The PersistenceServices package encapsulates the actual Java-Corba mapping for remote access to Corba interfaces of the databases, the interfaces being written in IDL. The server-side parts of the persistence services are located in Oracle8 databases, implemented as java  
10       code using JDBC to access the tables.

      All elements inside the interface layer follow a common design pattern, as shown in Fig 6. A controller Servlet listens to incoming http requests. The Servlet instantiates a java class, acting as a façade controller  
15       for the application logic. The façade object uses several internal java objects to accomplish the business rules for retrieving and storing data from the PersistenceServices package. Eventually, the controller Servlet determines from the façade controller what kind of result  
20       that shall be returned to the caller, and forwards the http request to the proper view JSP page. This JSP page uses information sent to the Servlet from the façade controller and produces an XML document, which is returned to the caller.

25       This design pattern has the advantages of separating presentation and application logic, and of encapsulating logic inside java components.

      Fig. 7 illustrates security issues for connecting the portal to the interface unit IF. At present, two ways  
30       of connecting the portal to the interface unit IF are contemplated. Either a VPN (Virtual Private Network) is set up (shown on the right-hand side of Fig. 7), or the portal is connected over the Internet using SSL (shown on the left-hand side of Fig. 7). In both embodiments, an  
35       encrypted communication link is established between the portal and the interface unit IF. Since encryption is very CPU intensive, hardware devices could terminate the



SSL or VPN link instead of the web servers. If the portal is connected to the interface unit via VPN, then VPN hardware could be used at both ends. If SSL is used, no extra hardware would be needed, but recommended, at the portal side. The web servers will always receive normal http requests from the portals.

With every request that a portal sends to the interface unit, a portal-ID and a password may be attached. These are received by the servlets, which may consult the UDB to authenticate the portal. If the portal is authenticated, appropriate roles and privileges to the interface layer elements may be determined. As an option, all portals could be required to submit a client certificate with the requests to the web server to authenticate the portal.

The operation of the portal will now be described by reference to exemplifying user scenarios.

In a first scenario, illustrated in Fig. 8, a pen owner uses a Pen Owner Portal to view the current pen settings. Here, it is assumed that the Pen Owner Portal is implemented in a servlet/JSP-enabled web server. The pen owner logs in to the Pen Owner Portal by submitting his username and password from the login web page. The username and password are encrypted with SSL. The Pen Owner Portal validates the pen owner with a member package. If the user is authenticated, the Pen Owner Portal starts a web session with the pen owner, by using a servlet session. The Pen Owner Portal displays a welcome page with a list of available functions. The pen owner is now logged in to the portal. Then, the pen owner selects the View Pen Settings function. The Pen Owner Portal retrieves, from the member package, the codes (pen identifier and PIN code) associated with the user. Then, the Pen Owner Portal makes an HTTP request to the Pen Services element of the interface unit, submitting the pen identifier and the PIN code. The Pen Owner Portal also submits its own login info (systemName and system-

Password) for authentication to the Pen Services element. The Pen Services element is implemented as an HttpServlet in a servlet/JSP-enabled web server. First, the Pen Services element consults the Authentication package to  
5 authenticate the calling system and determine the role it will have. This is done with the User and UDB classes. In this case, the role gives the Pen Owner Portal access rights to the pen settings interface, and has the privilege to perform the operation "get all settings". The Pen  
10 Services element retrieves the pen information from the pen database PDB. It compares the retrieved PIN code with the one submitted in the request by the portal. In the case of mismatch, no pen settings are returned to the portal. Otherwise, the Pen Services element filters out  
15 properties and returns only those settings to which the system has access rights (as determined by the User object). The Pen Services element returns the settings list to the servlet. The servlet constructs an XML document from those settings, and this document is sent as  
20 the response to the Pen Owner Portal. The Pen Owner Portal transforms the XML document into an HTML page suitable for a user to view. The HTML page is returned to the pen owners web browser.

In a second scenario, illustrated in Fig. 9, a  
25 pattern administrator creates a new position code license via the Partner Portal. The pattern administrator starts with a standard login procedure. The servlet uses the Authentication package to determine that the user has privileges to create service licenses. A request for a  
30 section of the virtual space is submitted by the user, for example by specifying a desired section size. Based on this request, the license is created, by a corresponding section of positions being allocated by the servlet in the virtual space database GSDB. Either before or  
35 after the allocation, the servlet may send an offer to the user indicating the allocated section. Upon receipt of an acceptance to the offer, the servlet sends a

license file to the licensee. The license file may, *inter alia*, include the position-code corresponding to the allocated section, or an algorithm for calculating the same. In an analogous procedure, a paper or product  
5 manufacturer or a service handler can create a service license by accessing the interface unit by logging in to the Partner Portal.

Although not shown in Fig.9, the second scenario may also allow for registration of a network address with the  
10 system. Here, the network address is submitted to the servlet, which stores the network address in the virtual space database GSDB in association with the allocated section. The network address identifies the service handler unit SH to which a requesting digital pen is to be  
15 directed by the server means ALS upon receipt of a position within the allocated section.

It is also conceivable that the interface unit IF is accessed directly by an application design program run on a network computer at the paper/product manufacturer or  
20 at the service handler. The application design program allows the paper/product manufacturer or the service handler to design a position-coded product with a desired layout and embedded functionality. Such an application design program is further disclosed in Applicant's international patent application No. PCT/SE01/01842, which is  
25 incorporated herein by this reference.

In a third scenario, schematically indicated in Figs 10 and 11, for actions taken on a manufacturer (client) side and in the interface unit, respectively, a pen manufacturer logs in to the Partner Portal and requests a  
30 series of pen identifiers (pen-ID) for pens to be manufactured. The interface unit IF allocates a series of pen identifiers to the pen manufacturer in the pen database PDB, and returns this series together with the public encryption key of the look-up unit ALS to the Partner  
35 Portal. In the production of pens, the pen manufacturer stores in the internal memory M of each pen a unique pen

identifier taken from the pen identifier series, and the public encryption key of the look-up unit ALS. Further, a public encryption key and an authentication code, such as a PIN code or a password, are generated for each pen, and  
5 a private encryption key is generated and stored in the internal memory M of each pen together with the authentication code. When the pens have been produced, the pen manufacturer registers all qualified pens, by logging in to the Partner Portal and by submitting the pen identifiers,  
10 fiers, public encryption keys and authentication codes of the pens to the interface unit IF for storage in the pen database PDB. A confirmation message is then submitted to the pen manufacturer through the Partner Portal.

It should be noted that the third scenario is generally applicable to any type of handheld electronic unit  
15 which is to be registered for use in an information management system. It should also be realized that one or more of the above actions might be modified or omitted, or the actions may be effected in a different order.

20 As an alternative to submitting feedback data, such as the license file, the pen identifier series, and the confirmation message, to the user through the Partner Portal, such feedback data could be transmitted by other electronic means, such as e-mail, or be provided for  
25 electronic download, or be stored on a computer readable medium and transmitted by regular mail.

The foregoing description of an implementation of the invention has been presented for the purposes of illustration and description. It is not exhaustive and  
30 does not limit the invention to the precise form disclosed. Modifications and variations are possible in light of the above teachings or may be acquired from practicing the invention.

## CLAIMS

1. An information management system comprising a plurality of products (P) provided with a position code (PC), a plurality of digital pens (DP) capable of reading the position code (PC), and a server means communicating with the digital pens (DP) in at least one communication network, said server means including a position database (GSDB) which associates positions coded by said position code (PC) with rules for information management, wherein the digital pens (DP) are arranged to communicate to the server means, on a first communication path, information which is registered on the products (P) in the form of at least one position which is coded by the position code (PC), characterized in that said server means includes an interface unit (IF) by means of which actors in the system, on a second communication path, are allowed to enter data into and retrieve data from one or more databases of the system.

2. A system according to claim 1, wherein the interface unit (IF) is arranged for connection to a host unit providing a graphical user interface.

3. A system according to claim 1 or 2, wherein the interface unit (IF) is arranged for connection to a host unit providing a site on a public network.

4. A system according to claim 2 or 3, wherein the host unit is a web server.

5. A system according to any one of claims 1-4, wherein the interface unit (IF) is connected to the position database (GSDB).

6. A system according to any one of claims 1-5, wherein the interface unit (IF) allows actors that provide the position code (PC) on the products (P) to allocate, in the position database (GSDB), one or more positions for specific information management.

7. A system according to claim 6, wherein the actors include service handlers, to which the server means,

based on said rules for information management, directs information registered with the digital pens (DP).

8. A system according to claim 6 or 7, wherein the actors include manufacturers of the products (P).

5       9. A system according to any one of claims 6-8, wherein the interface unit (IF) allows the actors to associate said one or more positions with a network address.

10       10. A system according to any one of claims 1-9, wherein the server means includes an event database (GEDB) which stores transaction data on the communication between the digital pens (DP) and the server means, and wherein the interface unit (IF) is connected to the event database (GEDB).

15       11. A system according to claim 10, wherein the interface unit (IF) allows owners of the digital pens (DP) to access at least part of said transaction data in the event database (GEDB).

20       12. A system according to any one of claims 1-11, wherein the server means includes a pen database (PDB) which stores a unique pen identifier (PID) for each of the digital pens (DP), and wherein the interface unit (IF) is connected to the pen database (PDB).

25       13. A system according to claim 12, wherein the interface unit (IF) allows manufacturers of the digital pens (DP) to register said pen identifiers of the digital pens (DP) in the pen database (PDB).

30       14. A system according to claim 12 or 13, wherein the pen database (PDB) includes settings for each of the digital pens (DP).

      15. A system according to claim 14, wherein the interface unit (IF) allows owners of the digital pens (DP) to store and/or change individual pen settings in the pen database (PDB).

35       16. A system according to any one of claims 12-15, wherein the pen database (PDB) associates a public encryption key with each of the digital pens (DP), and

wherein the interface unit (IF) allows manufacturers of the digital pens (DP) to store said public encryption key in the pen database (PDB).

17. A host unit which is arranged for communication with the interface unit (IF) of the system according to any one of claims 1-16, said host unit providing a site on a public network.

18. A host unit according to claim 17, which is further arranged for communication with at least one operator database (ASDB) of at least one operator of said at least one communications network.

19. A host unit according to claim 18, by means of which owners of the digital pens (DP) are able to access transaction data from said at least one operator database (ASDB), said transaction data relating to communication to and from the digital pen (DP) in the system.

20. A host unit according to claim 18 or 19, by means of which owners of the digital pens (DP) are able to store and/or change individual application settings in said at least one operator database (ASDB).

21. A method of coordinating actors in an information management system comprising a plurality of products (P) provided with a position code (PC), a plurality of digital pens (DP) capable of reading the position code (PC), and a server means communicating with the digital pens (DP) in at least one communication network, said server means including a position database (GSDB) which associates positions coded by the position code (PC) with rules for information management, wherein the digital pens (DP) are arranged to communicate to the server means, on a first communication path, information which is registered on the products (P) in the form of at least one position which is coded by the position code (PC), characterized by providing an interface unit (IF) in said server means, and allowing actors in the system, on a second communication path, to enter data

into and retrieve data from one or more databases of the system by means of the interface unit (IF).

22. A method according to claim 21, comprising the step of connecting to the interface unit (IF) a host unit  
5 which provides a graphical user interface.

23. A method according to claim 21 or 22, comprising the step of connecting to the interface unit (IF) a host unit which provides a site on a public network.

24. A method according to claim 22 or 23, wherein  
10 the host unit (IP) is a web server.

25. A method according to any one of claims 22-24, comprising the step of connecting the interface unit (IF) to the position database (GSDB).

26. A method according to any one of claims 22-25,  
15 comprising the step of allowing actors that provide the position code (PC) on the products (P) to allocate, in the position database (GSDB), one or more positions for specific information management.

27. A method according to claim 26, wherein said  
20 actors include service handlers, to which the server means, based on said rules for information management, directs information registered with the digital pens (DP).

28. A method according to claim 26 or 27, wherein  
25 the actors include manufacturers of the products (P).

29. A system according to any one of claims 26-28, comprising the step of allowing the actors to associate said one or more positions with a network address.

30. A method according to any one of claims 21-29,  
30 comprising the step of connecting the interface unit (IF) to an event database (GEDB) which stores transaction data on the communication between the digital pens (DP) and the server means.

31. A method according to claim 30, comprising the  
35 step of allowing owners of the digital pens (DP) to access at least part of said transaction data in the event database (GEDB).



32. A method according to any one of claims 21-31, comprising the step of connecting the interface unit (IF) to a pen database (PDB) which stores a unique pen identifier for each of the digital pens (DP).

5        33. A method according to claim 32, comprising the step of allowing manufacturers of the digital pens (DP) to register said pen identifiers of the digital pens (DP) in the pen database (PDB).

34. A method according to claim 32 or 33, wherein  
10 the pen database (PDB) includes settings for each of the digital pens (DP).

35. A method according to claim 34, comprising the step of allowing owners of the digital pens (DP) to store and/or change individual pen settings in the pen database  
15 (PDB).

36. A method according to any one of claims 32-35, wherein the pen database (PDB) associates a public encryption key with each of the digital pens (DP), said method comprising the step of allowing manufacturers of  
20 the digital pens (DP) to store said public encryption key in the pen database (PDB).

37. A method of creating a service license in an information management system in which information recorded from one or more position-coded products (P) is  
25 managed based on its position content, said service license activating one or more positions for information management, the method comprising: sending, from a client station (CS), a request for a service license; receiving, at the client station (CS), an offer to allocate one or  
30 more positions for information management; sending an acceptance in response to the offer; and receiving an information object allowing for creation of a position code (PC) corresponding to said one or more positions.

38. A method according to claim 37, wherein the  
35 request defines the dimensions to be spanned by said one or more positions to be allocated.

39. A method according to claim 37 or 38, further comprising submitting, at the client station (CS), a network address to be associated with said one or more positions.

5        40. A method of handling service licenses in an information management system in which a server means manages information recorded from one or more position-coded products (P) based on a position content of the information, said service license activating one or more  
10 positions for information management, the method comprising: receiving, at the server means, a request from a customer for a service license; allocating, in a database (GSDB) of the server means, one or more positions  
15 for information management; sending to the customer an offer to allocate said one or more positions; and, on receipt of an acceptance to the offer, sending an information object allowing for creation of a position code (PC) corresponding to said one or more positions.

20        41. A method according to claim 40, further comprising: receiving, at the server means, a network address from the customer; and storing said network address in the database (GSDB) in association with said one or more positions.

25        42. A method in producing digital units (DP) for communication with a server means in an information management system, the method comprising: sending, from a client station, a request for a specified number of unique identifying codes; receiving the identifying codes; and storing one such unique identifying code in  
30 a memory (M) of each digital unit (DP).

43. A method according to claim 42, comprising: receiving a public encryption key associated with said server means; and storing said public encryption key in a memory (M) of each digital unit (DP).

35        44. A method of administering digital units (DP) in an information management system, the method comprising: receiving, at a server means arranged for communication

with the digital units (DP), a request from a digital units manufacturer for a specified number of unique identifying codes; allocating, at the server means, said specified number of unique identifying codes in a database (PDB) of the server means; and sending said specified number of unique identifying codes to the digital units manufacturer.

45. A method according to claim 44, comprising: deriving, at the server means, a public encryption key associated with the server means; and sending said public encryption key to the digital units manufacturer.

46. A method of registering one or more digital units (DP) for communication with a server means in an information management system, comprising: generating a unique public encryption key for each digital unit (DP); sending, at a client station, one or more associated pairs of a unique identifying code and the public encryption key for each digital unit (DP); and receiving a confirmation that said one or more pairs are stored in said server means.

47. A method according to claim 46, comprising generating a unique authentication code for each digital unit (DP); sending, at the client station, one or more associated pairs of identifying codes and authentication codes; and receiving a confirmation that said one or more pairs are stored in said server means.

48. A method of registering one or more digital units (DP) in a server means in an information management system, the method comprising: receiving, at the server means, one or more associated pairs of a unique identifying code and a public encryption key for each digital unit (DP); storing said pairs in a database (PDB) of the server means; and issuing a confirmation of storing.

49. A method according to claim 48, comprising: receiving, at the server means, one or more associated pairs of the identifying code and an authentication code for each digital unit (DP); storing said pairs of identi-

fyng codes and authentication codes in the database  
(PDB); and issuing a confirmation of storing.

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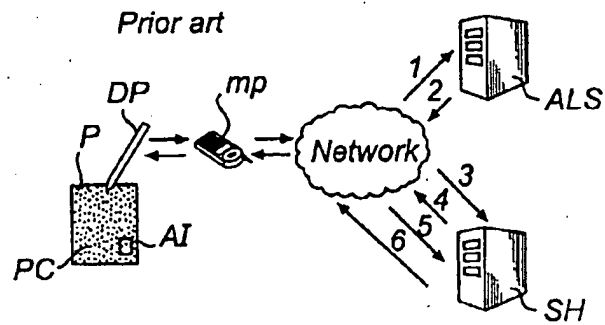


Fig. 1

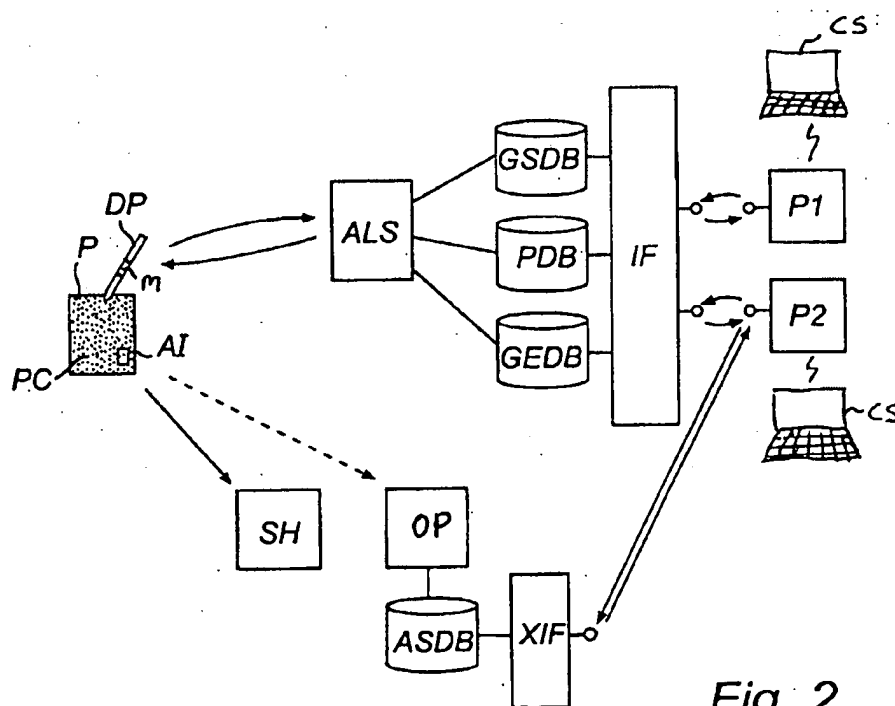


Fig. 2

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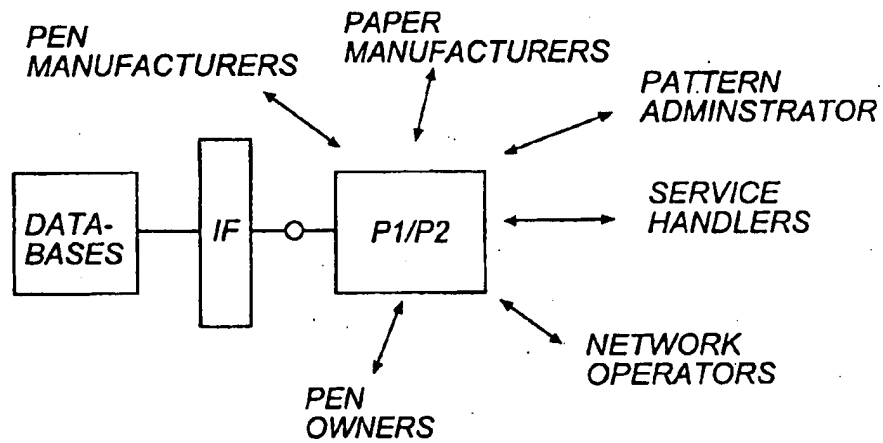


Fig. 3

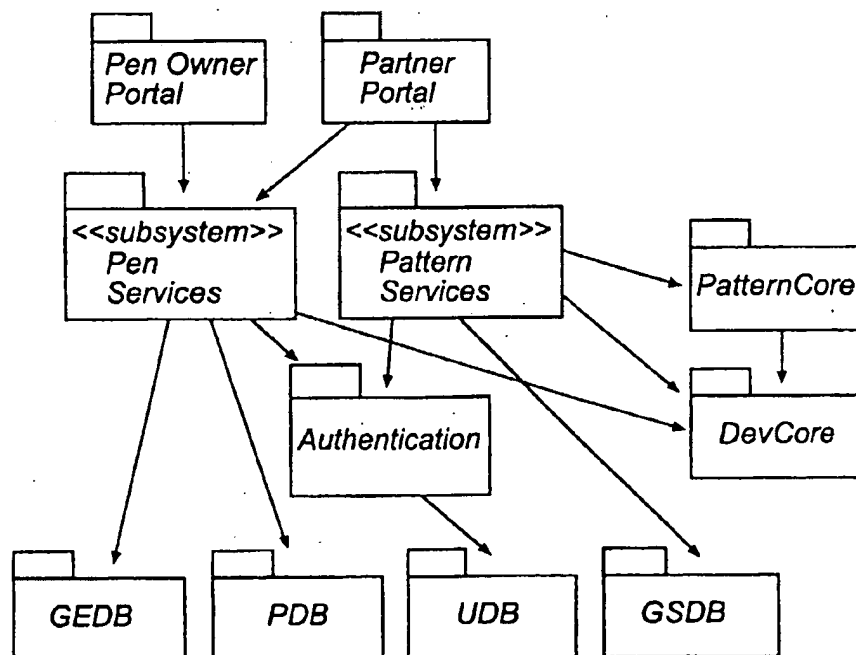


Fig. 4

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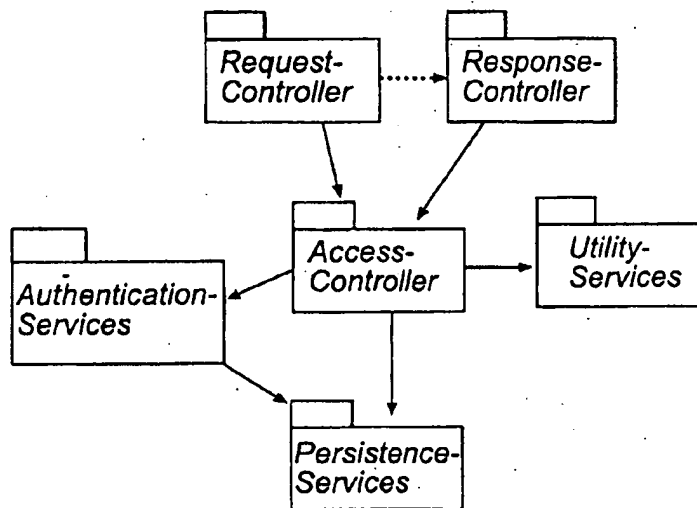


Fig. 5

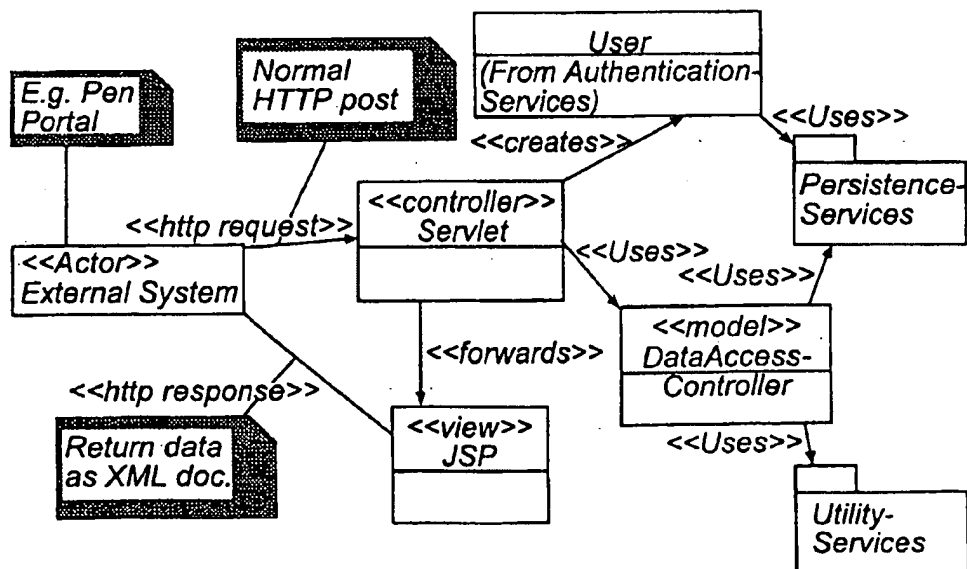


Fig. 6

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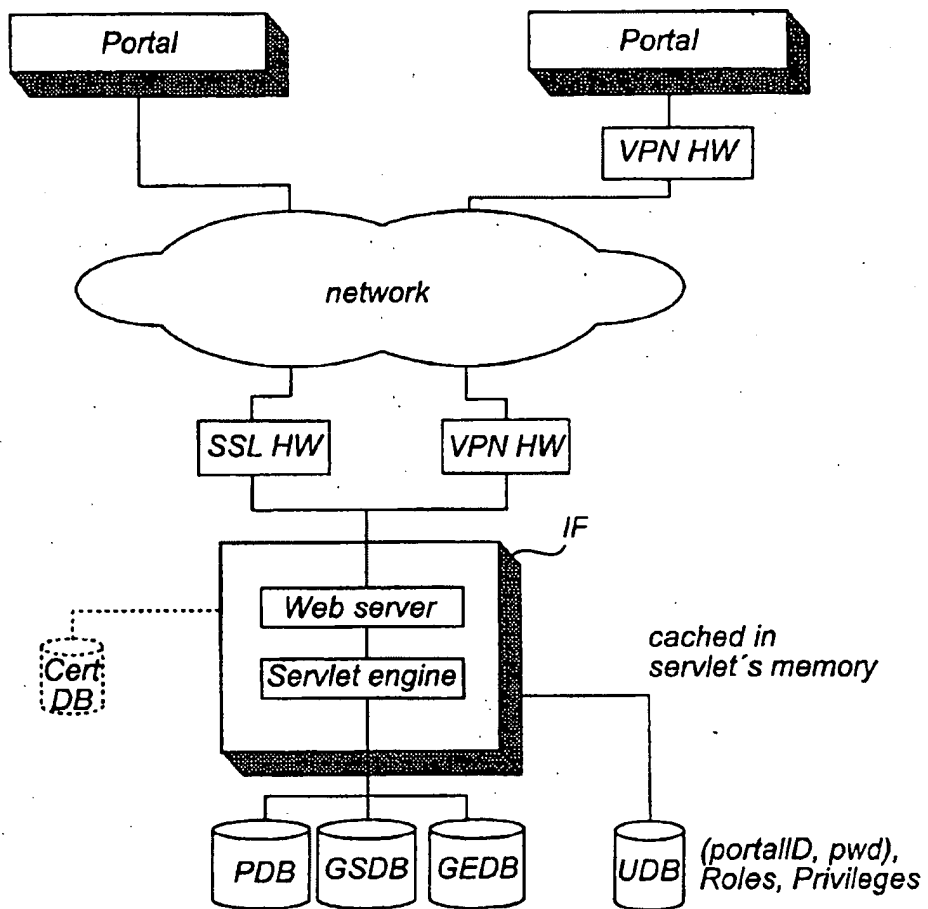


Fig. 7



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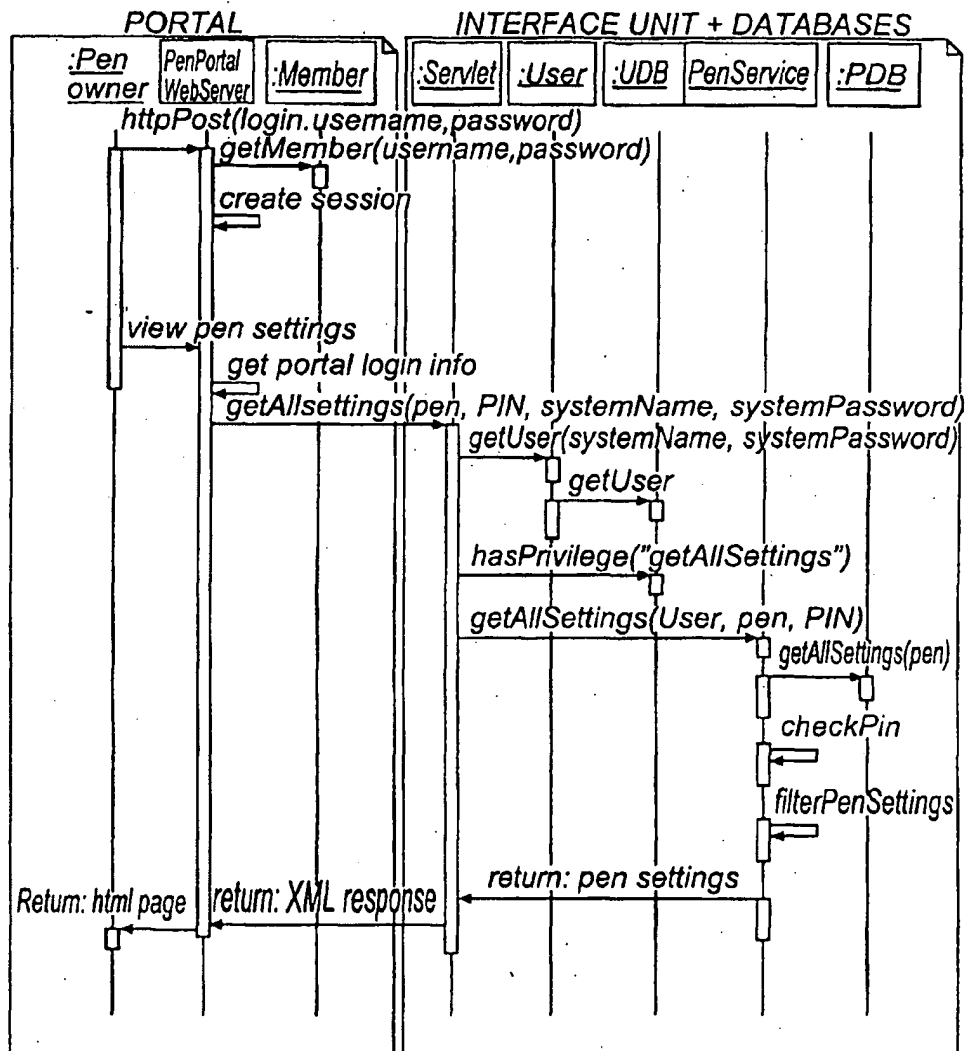


Fig. 8

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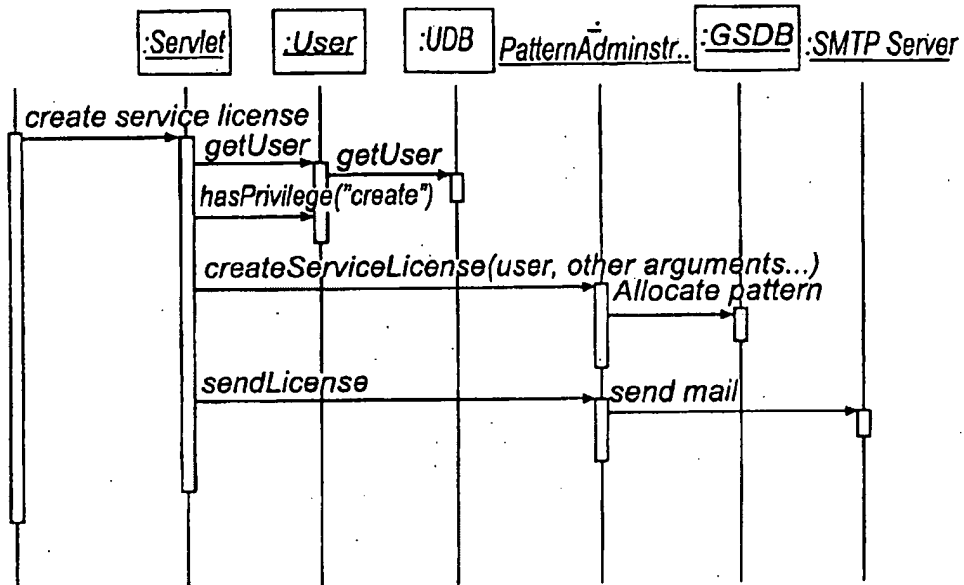
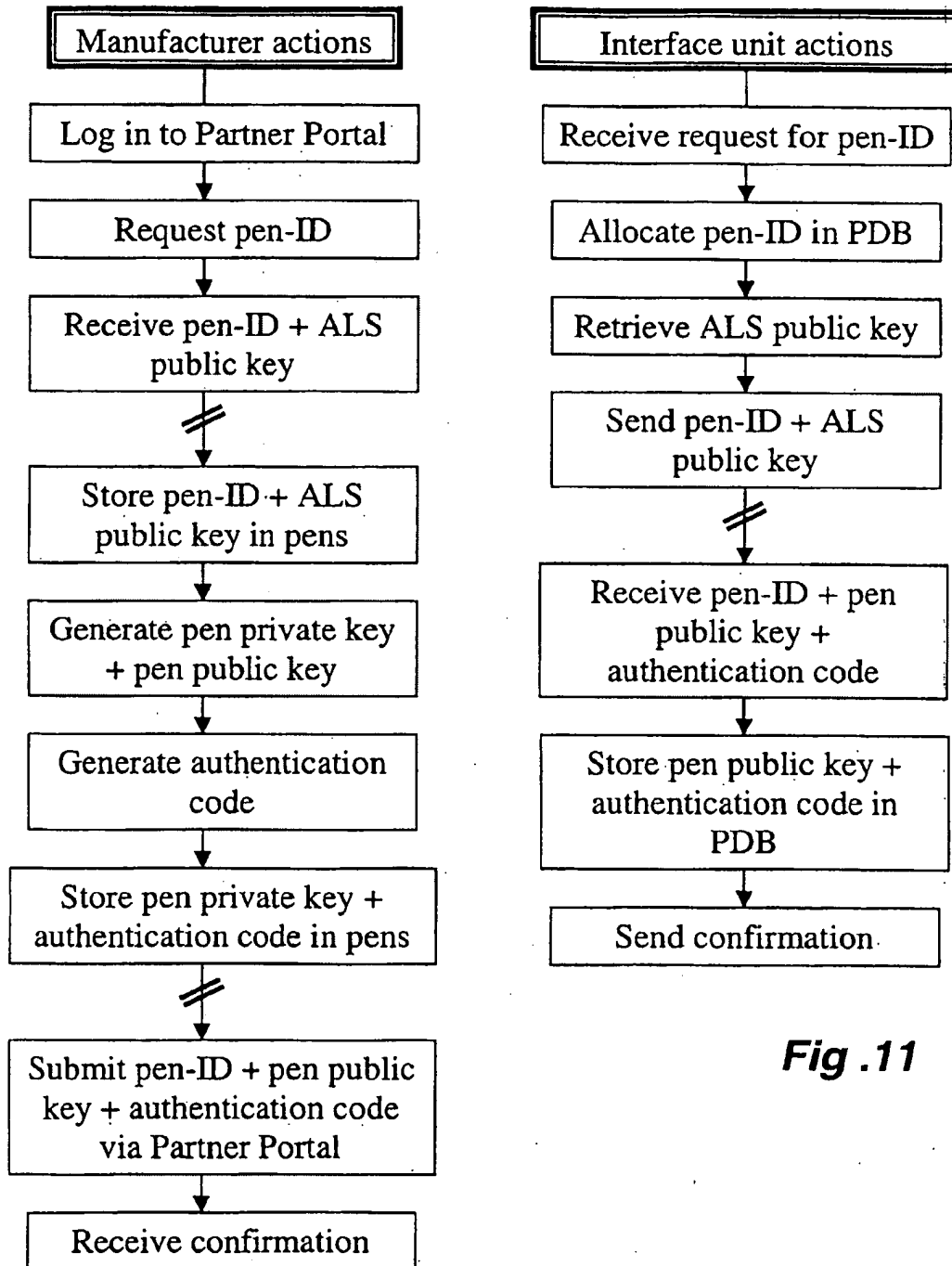


Fig. 9

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**Fig .11****Fig .10**

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 02/00548

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06F 17/60, G06K 19/06, G06K 1/12  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06F, G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	WO 9950787 A1 (XEROX CORPORATION), 7 October 1999 (07.10.99), page 5, line 1 - page 6, line 17, abstract --	1-49
A	WO 9939277 A1 (INTERVAL RESEARCH CORP), 5 August 1999 (05.08.99), abstract --	1-49
A	WO 0072245 A1 (SILVERBROOK RESEARCH PTY LTD), 30 November 2000 (30.11.00) -- -----	1-49

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

## \* Special categories of cited documents

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
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\*&\* document member of the same patent family

Date of the actual completion of the international search

27 May 2002

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